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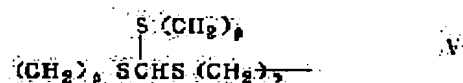
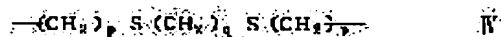
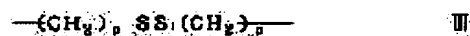
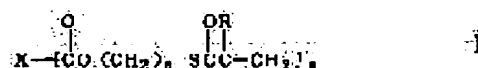
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(54) SULFUR-CONTAINING (METH)ACRYLATE COMPOUND AND ITS USE

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain the subject new compound, represented by a specific formula and capable of carrying out the polymerization in a short time and providing a plastic lens having good optical properties, especially a high refractive index and excellent dyeability.

SOLUTION: This compound is represented by formula I [R is H or methyl; X is represented by formula II to V [(p) and (q) are each 1-3]; (n) is 1-3; (m) is 2 or 3], e.g. bis(acryloylthioethyl thiodiglycolate). Furthermore, the compound is obtained by heating a sulfur-containing carboxylic acid, e.g. thiodiglycolic acid with 2-mercaptoethanol, etc., in the presence of a catalyst such as p-toluenesulfonic acid at 10-200° C, carrying out the dehydrating esterification while removing produced water and reacting the resultant polythiol compound with (meth)acryloyl chloride, etc., in an amount of 1-1.5mol based on 1mol SH group in the polythiol compound at -20 to +60° C.



LEGAL STATUS

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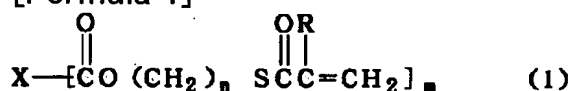
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CLAIMS

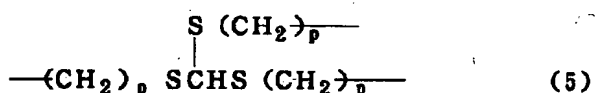
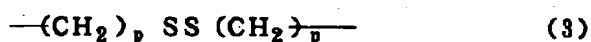
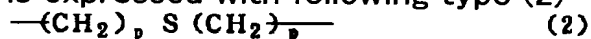
[Claim(s)]

[Claim 1] The sulfur-containing (meta) acrylate compound expressed with the following type (1) and (** 1).

[Formula 1]



one to which R expresses a hydrogen atom or a methyl group among [type, and X is expressed with following type (2) - (5) and (** 2) of ** -- [Formula 2]



It is] whose m it means (p and q express the integer of 1-3 among a formula, respectively), n expresses the integer of 1-3, and is 2 or 3.

[Claim 2] The constituent for plastic lenses containing a sulfur-containing (meta) acrylate compound according to claim 1.

[Claim 3] The constituent for plastic lenses containing at least one sort of the monomer in which a sulfur-containing (meta) acrylate compound and copolymerization are possible, or the Pori thiol compounds according to claim 2.

[Claim 4] Sulfur-containing resin obtained by carrying out the polymerization of the constituent according to claim 2 or 3.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the sulfur-containing resin which is made to carry out the polymerization of a new sulfur-containing (meta) acrylate compound, the constituent for plastic lenses containing this compound, and this constituent, and is obtained.

[0002]

[Description of the Prior Art] A plastic lens is lightweight compared with an inorganic lens, cannot break easily, and since it can dye, it is spreading through optical elements, such as a spectacle lens and a camera lens, quickly in recent years. As resin widely used for current and these purposes, there are some to which the radical polymerization of the diethylene-glycol screw (allyl carbonate) (D.A.C is called hereafter) was carried out. This resin has the various descriptions -- workability, such as excelling in shock resistance, a lightweight thing, excelling in the dye affinity, cutting ability, and polish nature, is good. however, this resin -- refractive index n_D 1.50 it is -- since it was small compared with an inorganic lens ($n_D = 1.52$), resin for lenses with a more high refractive index was desired.

[0003] D.A.C The polyurethane system lens is known as a lens with a refractive index higher than resin. this invention persons have proposed the polyurethane system lens which consists of a polymerization object of a xylylene diisocyanate compound and the Pori thiol compounds in JP,63-46213,A as this polyurethane system lens, and have spread widely as optical lenses, such as a lens for glasses. Moreover, the polyurethane system lens excellent in a light weight and shock resistance is proposed by JP,2-270859,A with the high refractive index with the combination of the specific Pori thiol compounds and an isocyanate compound. However, these resin needed to lengthen polymerization time amount, in order for a polymerization to tend to become an ununiformity and to obtain a homogeneous lens optically, and workability might become complicated. For this reason, the further amelioration was desired that these troubles should be solved.

[0004]

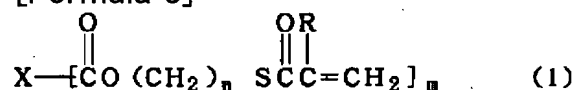
[Problem(s) to be Solved by the Invention] The purpose of this invention is offering the sulfur-containing resin for optics useful as a plastic lens which has the dye affinity which was acquired by the short-time polymerization, and had good optical physical properties and an especially high refractive index, and was very excellent.

[0005]

[Means for Solving the Problem] this invention persons come to complete a header and this invention for a certain kind of sulfur-containing (meta) acrylate compound being effective, as a result of inquiring wholeheartedly, in order to solve an above-mentioned technical problem. That is, this invention relates to the sulfur-containing resin which is made to carry out the polymerization of the sulfur-containing (meta) acrylate compound expressed with the following type (1) and (** 3), the constituent for plastic lenses containing the sulfur-containing (meta) acrylate compound expressed with a formula (1), and this constituent, and is obtained.

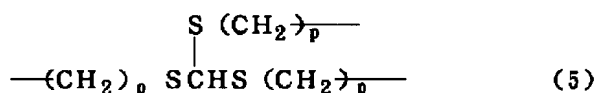
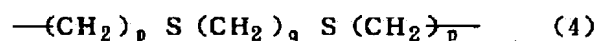
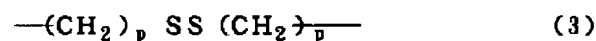
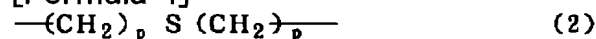
[0006]

[Formula 3]



They are one to which R expresses a hydrogen atom or a methyl group among [type, and X is expressed with following type (2) - (5) and (** 4) of radicals [0007].

[Formula 4]



It is] whose m it means (p and q express the integer of 1-3 among a formula, respectively), n expresses the integer of 1-3, and is 2 or 3.

[0008]

[The mode of implementation of invention] Hereafter, this invention is explained to a detail. The sulfur-containing (meta) acrylate compound of this invention can manufacture the Pori thiol compounds of the sulfur-containing carboxylic-acid derivative used as a mother frame as a start raw material. The Pori thiol compounds of a sulfur-containing carboxylic-acid derivative are manufactured by JP,1-90168,A by the approach of a publication, and the similar approach. Easily Namely, an available sulfur-containing carboxylic acid, for example, thiodiglycolic acid, thiodipropionic acid, 4, and 4-thio -- a jib -- a tongue acid and dithio diglycolic acid -- dithio dipropionic acid, 4, and 4-dithio -- a jib -- a tongue acid and methylenebis (thiodiglycolic acid) -- Methylenebis (thiodipropionic acid), methylenebis (thio a jib tongue acid), An ethylene screw (thiodiglycolic acid), an ethylene screw (thiodipropionic acid), An ethylene screw (thio a jib tongue acid), methine tris (thiodiglycolic acid), methine tris (thiodipropionic acid), methine tris (thio a jib tongue acid), etc., 2-mercaptoethanol, 3-mercapto propanol, etc. are heated at 10-200 degrees C under existence of the catalyst of p-toluenesulfonic acid, a sulfuric acid, a hydrochloric acid, etc. in a non-solvent or a solvent, and removing the water to generate, dehydration esterification can be carried out and

it can obtain.

[0009] As opposed to the one mol of the approaches of the following [compound / sulfur-containing (meta) acrylate / thiol compounds / of a sulfur-containing carboxylic-acid derivative / Pori], i.e., the sulfhydryl group of ** Pori thiol compounds The approach to which 1-1.5-mol acrylic-acid (meta) chloride etc. is made to react at -20 degrees C - 60 degrees C, 1-1.5-mol beta-chloro propionyl chloride or beta-chloro-alpha-methyl propionyl chloride is made to react at -20 degrees C - 80 degrees C to one mol of sulfhydryl groups of ** Pori thiol compounds. Or subsequently It is manufactured by the approach to which a 1-2-mol base is made to react at -20 degrees C - 60 degrees C.

[0010] In order to remove the hydrogen chloride generated in the case of a reaction, a base can also be made to live together as a hydrogen chloride supplement agent in the system of reaction at the above-mentioned reaction. Although especially the base as a hydrogen chloride supplement agent is not limited, alkylamine, such as a trimethylamine and triethylamine, a pyridine, a sodium hydroxide, a potassium hydroxide, etc. are mentioned as a base generally used. As a base used at the reaction of the latter part of the aforementioned **, alkylamine, such as a trimethylamine and triethylamine, is more desirable. In order to obtain the sulfur-containing (meta) acrylate compound of a high grade by high yield, as for the reaction of the preceding paragraph of the aforementioned **, it is desirable to carry out a direct reaction, removing the hydrogen chloride to generate out of a system without making a base live together as a hydrogen chloride supplement agent in the system of reaction.

[0011] Moreover, as another approach, the preceding paragraph of the aforementioned ** is reacted, it esterifies with a sulfur-containing carboxylic acid after that beforehand, and there is also a method of reacting the latter part of the aforementioned ** and subsequently, obtaining a sulfur-containing (meta) acrylate compound. Namely, one mol of sulfhydryl groups, such as 2-mercaptoethanol and 3-mercapto propanol, is received. 1-1.5-mol beta-chloro propionyl chloride or beta-chloro-alpha-methyl propionyl chloride is made to react at -20 degrees C - 80 degrees C. This, A sulfur-containing carboxylic acid is heated at 10-200 degrees C under catalyst existence, such as p-toluenesulfonic acid, a sulfuric acid, and a hydrochloric acid, and removing the water to generate, dehydration esterification is carried out and, subsequently it is the approach to which a base is made to react at -20 degrees C - 60 degrees C.

[0012] In these reactions, an organic solvent may be used if needed. Although especially the organic solvent used is not limited, what does not have the reactivity of raw materials required for a reaction can be used for it. As an organic solvent, ketones, such as ether, such as aliphatic series, such as benzene, toluene, a xylene, a hexane, a heptane, the petroleum ether, chloroform, a methylene chloride, and an ethylene chloride, aromatic hydrocarbon or halogenated hydrocarbon, diethylether, dioxane, and a tetrahydrofuran, an acetone, and a methyl ethyl ketone, N.N-dimethylformamide, etc. are mentioned, for example.

[0013] The constituent for plastic lenses of this invention contains the sulfur-containing (meta) acrylate compound of this invention, and contains at least one sort of the sulfur-containing (meta) acrylate compound of this invention and the

monomer in which this and copolymerization are possible, or the Pori thiol compounds. In the case of the constituent for plastic lenses containing other monomers or Pori thiol compounds, the sulfur-containing (meta) acrylate compound of this invention is 60 % of the weight or more more preferably 40% of the weight or more 20% of the weight or more to the whole quantity of a sulfur-containing (meta) acrylate compound, and the other monomers or the Pori thiol compounds.

[0014] In order that the monomer or the Pori thiol compounds of this invention in which a sulfur-containing (meta) acrylate compound and copolymerization are possible may adjust many physical properties, such as adjustment of optical physical properties, such as a refractive index, and shock resistance, specific gravity, in order to adjust the viscosity of a monomer, and the handling of others, it is chosen according to the purpose and especially limitation is not carried out. Moreover, the monomer or the Pori thiol compounds in which these copolymerization is possible can also be used for two or more sorts by using it independently, mixing.

[0015] As a monomer which can be copolymerized, for example Benzyl acrylate, benzyl methacrylate, BUCHIKISHI ethyl acrylate, butoxy methyl methacrylate, cyclohexyl acrylate, Cyclohexyl methacrylate, 2-hydroxyethyl acrylate, 2-hydroxymethyl methacrylate, glycidyl acrylate, glycidyl methacrylate, Phenoxy ethyl acrylate, phenoxy ethyl methacrylate, Phenyl methacrylate, ethylene glycol diacrylate, ethylene glycol dimethacrylate, Diethylene glycol diacrylate, diethylene-glycol dimethacrylate, Triethylene glycol diacrylate, triethylene glycol dimethacrylate, Tetraethylene glycol diacrylate, tetraethylene glycol dimethacrylate, Polyethylene-glycol diacrylate, polyethylene glycol dimethacrylate, Neopentyl glycol diacrylate, neopentyl glycol dimethacrylate, Ethylene glycol bis-glycidyl acrylate, ethylene glycol bis-glycidyl methacrylate, Bisphenol A diacrylate, bisphenol A dimethacrylate, 2 and 2-screw (4-AKUOKISHI diethoxy phenyl) propane, 2, and 2-screw (4-meta-KUROKISHI diethoxy phenyl) propane, Trimethylolpropane triacrylate, trimethylolpropanetrimethacrylate, Glycerol diacrylate, glycerol dimethacrylate, a pentaerythritol thoria chestnut rate, Pentaerythritol tetraacrylate, pentaerythritol tetra-methacrylate, Methylthio acrylate, methylthio methacrylate, phenylthio acrylate, Benzyl thio methacrylate, xylylene dithiol diacrylate, Xylylene dithiol dimethacrylate, mercapto ethyl sulfide diacrylate, Mercapto ethyl sulfide dimethacrylate, diallyl phthalate, Diaryl terephthalate, diallyl isophthalate, diaryl carbonate, diethylene-glycol bisallyl carbonate, styrene, chloro styrene, methyl styrene, bromostyrene, dibromo styrene, etc. are mentioned.

[0016] As Pori thiol compounds, 1, 2-ethane dithiol, 1, 3-propane dithiol, 1,2,3-propanetrithiol, 2, 3-dimercapto-1-propanol, A diethylene-glycol screw (2-mercapto acetate), a diethylene-glycol screw (3-mercaptopropionate), A trimethylol propane screw (2-mercapto acetate), a trimethylol propane screw (3-mercaptopropionate), Pentaerythritol tetrakis (2-mercapto acetate), pentaerythritol tetrakis (3-mercaptopropionate), 1, 2-dimercapto benzene, 1, 3-dimercapto benzene, 1, 4-dimercapto benzene, 1, 2-screw (mercaptomethyl) benzene, 1, 3-screw (mercaptomethyl) benzene, 1, 4-screw (mercaptomethyl) benzene, 1 and 2,

3-trimercapto benzene, 1, 2, 4-trimercapto benzene, 1 and 3, 5-trimercapto benzene, 1, 2, 3-tris (mercaptomethyl) benzene, 1 and 2, 4-tris (mercaptomethyl) benzene, 1, 3, 5-tris (mercaptomethyl) benzene, 4, and 4'-thio bis-benzenethiol, A screw (2-mercapto ethyl) sulfide, screw (2-mercapto ethyl thio) methane, 1, 2-screw (2-mercapto ethyl thio) ethane, 1, 3-screw (2-mercapto ethyl thio) propane, 1, 2, 3-tris (2-mercapto ethyl thio) propane, tetrakis (2-mercapto ethyl thiomethyl) methane, 1, a 2-screw (2-mercapto ethyl thio)-3-mercapto propane, 4, 8-screw (mercaptomethyl) - 3, 6, 9-TORICHIA -1, 11-undecane dithiol, 2, 5-dimercapto - 1, 4-dithiane, 2, 5-dimercaptomethyl -1, 4-dithiane, etc. are mentioned.

[0017] The sulfur-containing resin of this invention carries out the polymerization of said constituent, is obtained, and carries out copolymerization of the thing to which the polymerization of the sulfur-containing (meta) acrylate compound of this invention was carried out independently, or the sulfur-containing (meta) acrylate compound to the monomer in which other copolymerization is possible, or the Pori thiol compounds. Especially as a polymerization method for obtaining the sulfur-containing resin of this invention, it is not limited and the well-known radical polymerization approach can be taken. As a polymerization initiation means in this case, the exposures of use of radical initiators, such as various peroxides and an azo compound, or ultraviolet rays, a visible ray, alpha rays, beta rays, a gamma ray, an electron ray, etc. or these concomitant use are mentioned.

[0018] A well-known thing can be used as a radical initiator. As a typical thing Benzoyl peroxide, dicumyl peroxide, lauroyl peroxide, A G t-butyl par OKISHIAZE rate, t-butylperoxy-2-ethylhexanoate, T-butyl peroxy laurate, t-butyl peroxybenzoate, T-butylperoxy-3,5,5-trimethyl hexanoate, t-butyl peroxyacetate, Azo compounds, such as peroxides, such as screw (4-t-butyl cyclohexyl) peroxi dicarbonate and t-butylperoxyisopropylcarbonate, and azobisisobutyronitril, etc. are mentioned.

[0019] When irradiating ultraviolet rays etc. and making a polymerization start, a well-known sensitizer etc. can also be used. As a typical thing of a sensitizer, it is benzophenone, 4, and 4-diethylamino benzophenone, 1-hydroxy cyclohexyl phenyl ketone, p-dimethylamino isoamyl benzoate, 4-dimethylamino methyl benzoate, benzoin, benzoin ethyl ether, benzoin-isobutyl-ether, benzoin-iso-propyl-ether, 2, and 2-diethoxy acetophenone, methyl o-benzoylbenzoate, and 2-hydroxy. - 2-methyl-1-phenyl propane-1-ON, acyl phosphine oxide, etc. are mentioned.

[0020] A casting polymerization is mentioned as a typical polymerization method at the time of obtaining the sulfur-containing resin (for example, plastic lens) of this invention. That is, the constituent for plastic lenses of this invention containing a radical initiator, a sensitizer, or these both (it is also called monomer mixture) is poured in between the mold held on the gasket or the tape. At this time, if needed, even if it processes degassing etc., there is no inconvenience in any way.

Subsequently, ultraviolet rays etc. are irradiated, it can heat in oven, or these can be used together and stiffened, and a polymerization object can be taken out.

[0021] The polymerization method for obtaining the sulfur-containing resin of this invention, polymerization conditions, etc. cannot generally be limited with classes, such as an initiator to be used, an amount, and the class or rate of a monomer. For example, since it chooses the optimal temperature conditions in heating in oven

since cooling etc. is processed in order to prevent overheating of monomer mixture when irradiating ultraviolet rays etc. and, temperature control may be carried out. When heating in oven, the method of heating gradually from low temperature, holding at an elevated temperature generally, and completing a polymerization is adopted. Moreover, since it is influenced also about the time amount of a polymerization with classes, such as an initiator to be used, an amount, and the class and rate of a monomer, it cannot generally *****. Generally, it is possible to aim at compaction of polymerization time amount by the exposure of ultraviolet rays etc.

[0022] In the case of shaping of the sulfur-containing resin of this invention, various matter, such as a chain elongation agent, a cross linking agent, light stabilizer, an ultraviolet ray absorbent, an antioxidant, the oil color, and a bulking agent, may be similarly added in the well-known fabricating method according to the purpose. Moreover, about the taken-out sulfur-containing resin, annealing etc. may be processed if needed.

[0023] The sulfur-containing resin obtained using the sulfur-containing (meta) acrylate of this invention is a high refractive index, is low distribution and has the description which was excellent in thermal resistance, weatherability, and abrasion-proof nature, and was very excellent in especially the dye affinity. By changing the mold at the time of a casting polymerization, the sulfur-containing resin of this invention can be obtained as a Plastic solid of various gestalten, and can be used for various kinds of applications as optical element materials, such as a spectacle lens and a camera lens, and transparence resin. Especially, it is suitable as optical element materials, such as a spectacle lens and a camera lens. Furthermore, with the lens using the sulfur-containing resin of this invention, since acid resisting, high degree-of-hardness grant, wear-resistant improvement, chemical-resistant improvement, fog resistance grant, or fashionability grant is improved if needed, physical or chemical preparation, such as surface polish, antistatic treatment, rebound ace court processing, nonreflective coat processing, dyeing processing, and modulated light processing, can be performed.

[0024]

[Example] Hereafter, an example and the example of a comparison explain this invention concretely. In addition, the following examining methods estimated a refractive index, the Abbe number, the appearance, and the dye affinity among the performance tests of the obtained sulfur-containing resin.

– A refractive index, the Abbe number : it measured at 20 degrees C using Pulfrich refractometer.

– Besides It saw and observed by :viewing.

– Dye affinity : with the MLP color [Mitsui Toatsu Dye Co., Ltd.], the aquosity dyeing bath of 5 g/l was produced and 90 degrees C was dyed for 10 minutes. The resin (D.A.C resin) of CR-39 was dyed and compared with coincidence, and it evaluated as follows.

O : ** which dyes better than CR-39: x which dyes on a par with CR-39 : [CR-39 -- Mari Some -- being hard -- 0025] 22.5g [of thiodiglycolic acid] (0.15 mols) and 2-mercaptoethanol 35.2g (0.45 mols), benzene 200ml, and 1.0g of p-toluenesulfonic acid were taught to the reaction flask equipped with Dean Stark tubing which

attached example 1 agitator, the thermometer, and the capacitor, and the dehydration esterification reaction was performed at 80 degrees C for 1 hour. Next, after the bicarbonate-soda water solution washed the organic layer 5%, it washed with water further. After drying an organic layer with sulfuric anhydride magnesium, it distilled off under reduced pressure of benzene and thiodiglycolic acid screw (2-mercapto ethyl ester) 37.7g (0.14 mols) of a colorless liquid was obtained. Next, beta-chloro propionyl chloride 26.7g (0.21 mols) was taught to the reaction flask equipped with an agitator, a thermometer, a dropping funnel, gaseous introductory tubing, and an exhaust pipe, and it warmed at 50 degrees C, circulating nitrogen gas gently. Subsequently, thiodiglycolic acid screw (2-mercapto ethyl ester) 27.0g (0.10 mols) was dropped slowly, stirring. In this case, the occurring hydrogen chloride gas was absorbed in the trap of the sodium-hydroxide water solution besides a system. After dropping termination, it stirred at 50 degrees C for 5 hours, and the reaction was advanced. Next, having added toluene 200ml and cooling, the NaOH water solution was dropped 10%, and the inside of a system was made into alkalinity and was fully stirred. Then, the organic layer was separated and it washed with water. The organic layer was taught to the reaction flask equipped with the agitator, the thermometer, and the dropping funnel, and triethylamine 22.3g (0.22 mols) was dropped gradually, cooling and stirring at 10 degrees C or less. It stirred at 25 more degrees C after dropping termination for 4 hours. Then, toluene 300ml and 200ml of water were added, and after extracting the resultant in the organic layer and separating liquids, dilute hydrochloric acid, a rare bicarbonate-soda water solution, and water washed the organic layer. After drying an organic layer with sulfuric anhydride magnesium, it distilled off under reduced pressure of toluene and target sulfur-containing acrylate transparent and colorless compound and thiodiglycolic acid screw (acryloyl thio ethyl ester) 32.9g (0.087 mols) was obtained. This thing and 1 H-NMR (CDCl₃ inside of solvent, tetramethylsilane criteria) chart were shown in (drawing 1).

[0026] Methylenebis (thioglycolic acid) 29.4g (0.15 mols), 2-mercaptoethanol 35.2g (0.45 mols), toluene 200ml, and 3.0g of p-toluenesulfonic acid, sulfuric anhydride calcium (product made from dry alite and W.A.HAMMOND DRIERITE CO.) 180g was further taught as a dehydrating agent, and the dehydration esterification reaction was performed in the reaction flask equipped with example 2 agitator and the thermometer at 60 degrees C for 3 hours. After reaction termination, suction filtration of the reaction mixture was carried out, and the calcium sulfate was removed. Next, after the bicarbonate-soda water solution washed the organic layer 5%, it washed with water further. After drying an organic layer with sulfuric anhydride magnesium, it distilled off under reduced pressure of toluene and methylenebis [thioglycolic acid screw (2-mercapto ethyl ester)] 43.2g (0.136 mols) of a colorless liquid was obtained. This methylenebis [thioglycolic acid (2-mercapto ethyl ester)] 31.6g (0.10 mols) was used, by the same actuation as an example 1, the acrylic esterification reaction was performed and a transparent and colorless sulfur-containing acrylate compound and methylenebis [thioglycolic acid (acryloyl thio ethyl ester)] 34.4g (0.081 mols) were obtained. This thing and 1 H-NMR (CDCl₃ inside of solvent, tetramethylsilane criteria) chart were shown in (drawing 2).

[0027] Except having replaced methylenebis (thioglycolic acid) 29.4g (0.15 mols) of example 3 example 2 with 27.3g (0.15 mols) of dithio diglycolic acid, like the example 2, the dehydration esterification reaction was performed and dithio diglycolic acid screw (2-mercapto ethyl ester) 42.6g (0.141 mols) was obtained. This dithio diglycolic acid screw (2-mercapto ethyl ester) 30.2g (0.10 mols) was used, by the same actuation as an example 1, the acrylic esterification reaction was performed and transparent and colorless sulfur-containing acrylate compound and dithio diglycolic acid screw (acryloyl thio ethyl ester) 38.6g (0.094 mols) was obtained. This thing and $^1\text{H-NMR}$ (CDCl_3 inside of solvent, tetramethylsilane criteria) chart were shown in (drawing 3).

[0028] Except having replaced methylenebis (thioglycolic acid) 29.4g (0.15 mols) of example 4 example 2 with methine tris (thioglycolic acid) 43.0g (0.15 mols), like the example 2, the dehydration esterification reaction was performed and methine tris [thioglycolic acid (2-mercapto ethyl ester)] 62.1g (0.133 mols) was obtained. This methine tris [thioglycolic acid (2-mercapto ethyl ester)] 46.7g (0.10 mols) was used, by the same actuation as an example 1, the acrylic esterification reaction was performed and a transparent and colorless sulfur-containing acrylate compound and methine tris [thioglycolic acid (acryloyl thio ethyl ester)] 56.5g (0.090 mols) were obtained. This thing and $^1\text{H-NMR}$ (CDCl_3 inside of solvent, tetramethylsilane criteria) chart were shown in (drawing 4).

[0029] It is 2-hydroxy as 50mg of t-butylperoxy2-ethylhexanoate, and a sensitizer as a radical polymerization initiator to thiodiglycolic acid screw (acryloyl thio ethyl ester) 50g obtained in the example 5 example 1. - 2 - Methyl-1-phenyl propane-1-ON 50mg could be added, and it mixed. It poured into the mold mold which consists of glass mold and a gasket, after fully carrying out degassing of this. After irradiating ultraviolet rays for 5 minutes, cooling, the temperature up was carried out over 30 minutes from 30 degrees C to 120 degrees C, it heated at 120 more degrees C for 1 hour, and the polymerization was performed. After polymerization termination, it cooled gradually and the Plastic solid was taken out from mold. The acquired Plastic solid (lens) was transparent and colorless, and were refractive-index $n_d = 1.587$ and Abbe number $n_{ud} = 39.8$. Moreover, when dyed, it dyed very well, and evaluation of a dye affinity was "O."

[0030] It is 2-hydroxy as 70mg of t-butylperoxy2-ethylhexanoate, and a sensitizer as a radical polymerization initiator to methylenebis [thioglycolic acid (acryloyl thio ethyl ester)] 50g obtained in the example 6 example 2. - 2 - Methyl-1-phenyl propane-1-ON 100mg could be added, and it mixed. It poured into the mold mold which consists of glass mold and a gasket, after fully carrying out degassing of this. After irradiating ultraviolet rays for 7 minutes, cooling, the temperature up was carried out over 30 minutes from 30 degrees C to 130 degrees C, it heated at 130 more degrees C for 1 hour, and the polymerization was performed. After polymerization termination, it cooled gradually and the Plastic solid was taken out from mold. The acquired Plastic solid (lens) was transparent and colorless, and were refractive-index $n_d = 1.599$ and Abbe number $n_{ud} = 38.4$. Moreover, when dyed, it dyed very well, and evaluation of a dye affinity was "O."

[0031] To dithio diglycolic acid screw (acryloyl thio ethyl ester) 50g obtained in the example 7 example 3, 50mg of t-butylperoxy2-ethylhexanoate could be added as a

radical polymerization initiator, acyl phosphine oxide 50mg could be added as a sensitizer, and it mixed. It poured into the mold mold which consists of glass mold and a gasket, after fully carrying out degassing of this. After irradiating ultraviolet rays for 5 minutes, cooling, the temperature up was carried out over 30 minutes from 30 degrees C to 120 degrees C, it heated at 120 more degrees C for 1 hour, and the polymerization was performed. After polymerization termination, it cooled gradually and the Plastic solid was taken out from mold. The acquired Plastic solid (lens) was transparent and colorless, and were refractive-index $n_d = 1.603$ and Abbe number $n_{ud} = 37.3$. Moreover, when dyed, it dyed very well, and evaluation of a dye affinity was "O."

[0032] It is 2-hydroxy as 150mg of t-butylperoxy2-ethylhexanoate, and a sensitizer as a radical polymerization initiator to methine tris [thioglycolic acid (acryloyl thio ethyl ester)] 50g obtained in the example 8 example 4. - 2 - Methyl-1-phenyl propane-1-ON 100mg could be added, and it mixed. It poured into the mold mold which consists of glass mold and a gasket, after fully carrying out degassing of this. After irradiating ultraviolet rays for 10 minutes, cooling, the temperature up was carried out over 30 minutes from 30 degrees C to 130 degrees C, it heated at 130 more degrees C for 1 hour, and the polymerization was performed. After polymerization termination, it cooled gradually and the Plastic solid was taken out from mold. The acquired Plastic solid (lens) was transparent and colorless, and were refractive-index $n_d = 1.607$ and Abbe number $n_{ud} = 37.6$. Moreover, when dyed, it dyed very well, and evaluation of a dye affinity was "O."

[0033] It is 2-hydroxy as 50mg of t-butylperoxy2-ethylhexanoate, and a sensitizer to methine tris [thioglycolic acid (acryloyl thio ethyl ester)] 40g obtained in the example 9 example 4 as 2, 2-screw (4-meta-KUOKISHI diethoxy phenyl) propane [trade name and Sartomer (SR-348)] 10g, and a radical polymerization initiator. - 2 - Methyl-1-phenyl propane-1-ON 100mg could be added, and it mixed. It poured into the mold mold which consists of glass mold and a gasket, after fully carrying out degassing of this. Since the viscosity of monomer mixture was low as compared with an example 8, impregnation was easy. After irradiating ultraviolet rays for 10 minutes, cooling, the temperature up was carried out over 1 hour from 30 degrees C to 130 degrees C, it heated at 130 more degrees C for 1 hour, and the polymerization was performed. After polymerization termination, it cooled gradually and the Plastic solid was taken out from mold. The acquired Plastic solid (lens) was transparent and colorless, and refractive-index $n_d = 1.598$, Abbe number $n_{ud} = 38$, and specific gravity were 1.36. Moreover, when dyed, it dyed very well, and evaluation of a dye affinity was "O."

[0034] It is [trimethylolpropanetrimethacrylateg / 7.5 / and 1 and 2-screw (2-mercapto ethyl thio)-3-mercapto propane 5.0g and] 2-hydroxy as 50mg of t-butylperoxy2-ethylhexanoate, and a sensitizer as a radical polymerization initiator to methine tris [thioglycolic acid (acryloyl thio ethyl ester)] 37.5g obtained in the example 10 example 4. - 2 - Methyl-1-phenyl propane-1-ON 100mg could be added, and it mixed. It poured into the mold mold which consists of glass mold and a gasket, after fully carrying out degassing of this. Since the viscosity of monomer mixture was low as compared with an example 8, impregnation was easy. After irradiating ultraviolet rays for 7 minutes, cooling, the temperature up was carried

out over 1 hour from 30 degrees C to 130 degrees C, it heated at 130 more degrees C for 1 hour, and the polymerization was performed. After polymerization termination, it cooled gradually and the Plastic solid was taken out from mold. The acquired Plastic solid (lens) was transparent and colorless, and refractive-index $n_d = 1.599$, Abbe number $nud = 40$, and specific gravity were 1.37. Moreover, when dyed, it dyed very well, and evaluation of a dye affinity was "O."

[0035]

[Effect of the Invention] The plastic lens which the sulfur-containing (meta) acrylate compound of this invention is a new compound, and a short-time polymerization is possible for the constituent of this invention, and has good optical physical properties and an especially high refractive index, and has the outstanding dye affinity is given.

[Translation done.]

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